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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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12/12/2000

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7590

08/12/2004

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EXAMINER

LOKE, STEVEN HO YIN

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 08/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/734,176

Applicant(s)

MIKAWA ET AL.

Examiner

Steven Loke

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 July 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-5,10 and 13-24 is/are pending in the application.
- 4a) Of the above claim(s) 3-5 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,10 and 13-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

1. Claims 18-22 and 24 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The specification (page 7, lines 9-10, page 14, lines 14-15) discloses the multilayer structure is made up of metal oxide and metal nitride films. The specification never discloses the multilayer structure being made up of metal nitride films as claimed in claim 18.

The specification never discloses the multilayer structure being made up of metal oxide films and metal nitride films as claimed in claims 21 and 24.

2. Claims 16, 21 and 23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 16, line 2, the phrase "the capacitive insulating" is unclear whether it is being referred to "the capacitive insulating film" of claim 1.

Claim 21, line 8, the phrase "the capacitive insulating" is unclear whether it is being referred to "the capacitive insulating film" of line 3.

Claim 23, line 2, the phrase "a lower electrode form a substrate" is not understood. Fig. 1A discloses a lower electrode [2] formed on a substrate [1]. It is believed that the phrase should rewrite as "a lower electrode formed on a substrate".

3. Claims 22 and 24 are objected to because of the following informalities: Claim 22, line 3, the phrase "nitride of Ta" is unclear whether it is being referred to "a nitride of Ta". Claim 24, line 2, the phrase "the including..." is unclear whether it is being referred to "including..."; lines 7-8, the phrase "the capacitor device" has no antecedent basis. Appropriate correction is required.

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1, 10, 14-20 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by Jung et al. (U. S. Patent 6,515,323).

In regards to claim 1, Jung et al. show all the elements of the claimed invention in fig. 1J. It is a semiconductor device, comprising: a lower electrode [112] formed on a substrate [100]; a capacitive insulating film [114] formed out of a ferroelectric film on the lower electrode; an upper electrode [118] formed on the capacitive insulating film; a contact layer [120] formed directly on the upper electrode so as not to contact with the capacitive insulating film; wherein the contact layer [120] is provided on a surface of the upper electrode [118] and in a region other than the region where a metal interconnect [138] is connected to the upper electrode [118], and wherein the contact layer [120] is a single layer film, the single-layer film being made of a metal oxide (titanium dioxide).

In regards to claim 10, Jung et al. further disclose the metal oxide film is made of an oxide of Ti.

In regards to claim 14, Jung et al. further disclose the insulating film [134] is unlikely to peel off due to the contact layer [120] because the oxygen atoms of the diffusion barrier layer [122] and the contact layer [120] are bounded to the oxygen atoms of the oxide layer [134].

In regards to claim 15, Jung et al. inherently disclose the contact layer [120] is made from metal atoms (Ti) which are unlikely to diffuse into the upper electrode [118] (Pt) because Ti atoms are bounded to the oxygen atoms in the titanium dioxide layer.

In regards to claim 16, Jung et al. further disclose an insulating film [134] formed to cover the lower electrode [112], the capacitive insulating film [114], the upper electrode [118] and the contact layer [120], wherein the entire upper surface of the upper electrode [118] is in no contact with the insulating film [134].

In regards to claim 17, Jung et al. further disclose a portion of the upper surface of the upper electrode [118] is not covered by the contact layer [120] and connected to the metal interconnect [138].

In regards to claim 18, Jung et al. show all the elements of the claimed invention in fig. 1J. It is a semiconductor device, comprising: a lower electrode [112] formed on a substrate [100]; a capacitive insulating film [114] made of a ferroelectric film on the lower electrode; an upper electrode [118] formed on the capacitive insulating film; and a contact layer [120] formed directly on the upper electrode so as to be in no contact with the capacitive insulating film, wherein a portion of the upper surface of the upper

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electrode is not covered by the contact layer and connected to a metal interconnect [138], and the contact layer is a single layer film, the single-layer film being made of a metal oxide (titanium dioxide).

In regards to claim 19, Jung et al. further disclose the metal oxide film is made of an oxide of Ti.

In regards to claim 20, Jung et al. further disclose an insulating film [134] formed to cover the lower electrode [112], the capacitive insulting film [114], the upper electrode [118] and the contact layer [120].

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jung et al. in view Kanaya et al.

In regards to claim 13, Jung et al. differ from the claimed invention by not showing the ferroelectric film includes $\text{SrBi}_2\text{Ta}_2\text{O}_9$.

Kanaya et al. show the ferroelectric film [412A] of a capacitor (fig. 48) includes $\text{SrBi}_2\text{Ta}_2\text{O}_9$ (col. 22, lines 1-6).

Since both Jung et al. and Kanaya et al. teach a ferroelectric film capacitor, it would have been obvious to have the $\text{SrBi}_2\text{Ta}_2\text{O}_9$ ferroelectric film of Kanaya et al. in Jung et al. because it improves the capacitance of the capacitor.

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 21, 22 and 24 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Miyasaka et al. (Japanese patent no. 11-307733 in the IDS filed on 1/10/02).

In regards to claim 21, Miyasaka et al. show all the elements of the claimed invention in fig. 1. It is a semiconductor device, comprising: a lower electrode [120] formed on a substrate [104]; a capacitive insulating film [122] made of a ferroelectric film on the lower electrode; an upper electrode [124] formed on the capacitive insulating film; a contact layer [126] formed directly on the upper electrode [124] so as to be in no contact with the capacitive insulating film [122]; and an insulating film [128] formed directly on the contact layer [126] so as to cover the lower electrode [120], the capacitive insulating film [122] and the upper electrode [124], and the insulating film [128] being connected to the lower electrode [120] and/or the capacitive insulating film [122], wherein the entire upper surface of the upper electrode [124] is in no contact with the insulating film [128], and wherein the contact layer [126] is a single-layer film, the single-layer film being made of a metal nitride (titanium nitride).

In regards to claim 22, Miyasaka et al. further disclose the metal nitride film is made of a nitride of Ti.

In regards to claim 24, Miyasaka et al. show all the elements of the claimed invention in fig. 1. It is a semiconductor device, comprising: a capacitor [118] formed on a substrate [104] and the including a lower electrode [120], a capacitive insulating film [122] of a ferroelectric film and an upper electrode [124]; and a contact layer [126] formed directly on the upper electrode [124] so as to be in no contact with the capacitive insulating film, wherein the entire upper surface of the upper electrode is in no contact with an insulating film [128] which is formed directly on the contact layer, so as to cover the capacitor device, and in contact with the lower electrode [120] and/or the capacitive insulating film [122], and wherein the contact layer [126] is a single-layer film, the single-layer film being made of a metal nitride (titanium nitride).

10. Claim 23 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action.

11. The following is a statement of reasons for the indication of allowable subject matter: The major difference in the claim not found in the prior art of record is the contact layer is made from TaO or TaN.

12. Applicant's arguments with respect to claims 1, 10, 13, 14, 15 have been considered but are moot in view of the new ground(s) of rejection.

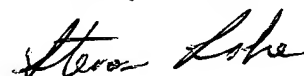
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven Loke whose telephone number is (571) 272-1657. The examiner can normally be reached on 7:50 am to 5:20 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (571) 272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

sl
August 8, 2004

Steven Loka
Primary Examiner

A handwritten signature in black ink, appearing to read "Steven Loka", written in a cursive style.